1886MNRAS..46..155H

Lunar Occultations.

January 21, 1885.—B.A.C. 57; fair definition; power, 62; aperture, $9\frac{1}{3}$ inches.

Disappearance, $5^h\ 38^m\ 5^s$, G.M.T.
Reappearance, $6^h\ 48^m\ 33^s$ „
Nautical Almanac times, $5^h\ 39^m$ and $6^h\ 52^m$.

February 20.—38 *Arietis*, $0^h\ 5^m$, escaped occultation; never very near the Moon's limb.

February 22.—*α Tauri*; disappearance, $5^h\ 9^m$ ± ; reappearance, $5^h\ 55^m\ 13^s$, G.M.T.

A New Form of Governor for the Driving-Clocks of Equatorials.

By A. Hilger.

I have the honour of bringing before the Royal Astronomical Society a driving governor which I believe will prove of interest to those who consider uniformity of motion an important matter for an equatorial telescope, and especially to those engaged in the photography of the heavenly bodies.

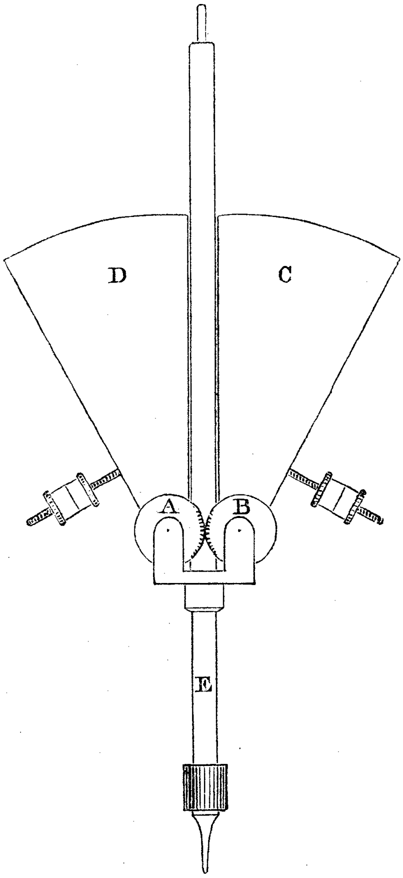
In former years I have made a great number of Foucault's clocks, with the construction of which many Fellows will be well acquainted, and which twenty years ago were considered—as perhaps they are still, especially in France—the best form of driving-clock for an equatorial. My governor, so far as the fans are concerned, much resembles that of Foucault. A somewhat similar governor, but with three fans, was devised by the late M. Yvon Villarceau; besides these I do not know of any other fan governors, though such may undoubtedly exist.

But there were points in the Foucault governor with which I was by no means satisfied, especially the great complication of pieces and the great amount of friction, which all means error. I do not believe in any form of control which depends upon friction, and finding that, generally speaking, all driving-clocks are so controlled, I have worked out the present design, which is the result of years of experience. I do not think that any governor could have less friction while in action than this particular form, which I claim as my own invention. The friction is entirely confined to the four fine points which carry the two fans D and C. There is no other friction in the governing action whilst these are in motion.

In all forms of governors the clock is liable to go slower either when the fans or governor-balls close, or when the driving weight is reduced. It is not so with this form of clock; an addition of 140 lbs. more or less to the driving-weight will make no appreciable difference in the speed. The speed remains unchanged whether the fans are wide open or nearly closed; I say nearly closed, because, of course, as soon as the fans touch the spindle the control ceases.

1886MNRAS..46..155H

The fans are pulled towards the spindle E by chronometer springs in box A and B, which will only allow them to open when a speed of from twenty-five to thirty revolutions a second is attained. The spring is only wound up half a revolution, so that the mean motion of the fans, which does not exceed more than thirty degrees on either side, keeps the spring perfectly free in the air. There is also another very important point in this governor: you will observe that there is no parallelogram motion to keep the fans equally inclined to the centre spindle, and yet that under every variation of position, from vertical to horizontal, the fans always open symmetrically.



When I first tried the governor I found that the rate varied appreciably with the inclination of the fans to the spindle. To overcome this defect I attached small weights to the fans on screws perpendicular to their long axes: and by adjusting the position of these weights on the screws, I found it possible to obtain a quite uniform rate for a very considerable variation in the driving weight, or—what would be the same thing in actual practice—in the friction of the instrument driven.

1886MNRAS..46..155H

Note on Mr. Marth's "Intersects." By H. H. Turner, B.A., B.Sc

§ 1. In some recent numbers of the *Monthly Notices* (vol. xlv. pp. 370 and 483), Mr. Marth has described an interesting method of obtaining a graphical representation of the Solar System, each orbit being represented by its trace on a plane which passes through the centre of the Sun and revolves about an axis perpendicular to the ecliptic. The following brief remarks on the general nature of these curves may be of interest:—

§ 2. Let

S be the centre of the Sun, and P any point in the orbit.
i = inclination of orbit to the ecliptic.
ω = angle between line of nodes and major axis of orbit.
r = distance of P from S.
w = „ „ „ „ line of nodes.
x = „ „ „ „ directrix of orbit.
z = „ „ „ „ major axis of orbit.
y = „ „ „ „ ecliptic.
p = „ „ S „ directrix of orbit.

Then we have the following relations among these quantities:—

$$\left.\begin{aligned} y &= w \sin i \\ r &= ex \\ r^2 &= (x-p)^2 + z^2 \\ w &= z \cos\omega - (x-p)\sin\omega \end{aligned}\right\} \quad . \; . \; . \; . \; . \; . \; . \; . \quad (1)$$

Eliminating w, x, z from these four equations, we get the equation

$$e^2 r^2 \cos^2\omega = e^2 y^2 \operatorname{cosec}^2 i + 2ey(r-ep)\sin\omega \operatorname{cosec} i + (r-ep)^2 \quad . \; . \quad (2)$$

and considering the point in the intersect corresponding to P, as defined by the coordinates r and y, this is the equation to the "intersect."

§ 3. If we write x in place of r in this equation (where x is now the usual Cartesian coordinate), we get the conic

$$\begin{gathered} x^2(1-e^2\cos^2\omega) + 2e\sin\omega \operatorname{cosec} i\,.\,xy + e^2 y^2 \operatorname{cosec}^2 i, \\ -2e^2 p \sin\omega \operatorname{cosec} i\,.\,y - 2epx + e^2 p^2 = 0. \end{gathered}$$

The second invariant is

$$e^2 \sin^2\omega \operatorname{cosec}^2 i\,(e^2 - 1)$$